GENERON
Advanced Transfer Technologies

MODIfinder DETECTION ASSAY GMO CORN

User Guide

1 - Introduction

The introduction of GMO crops in the food chain led to the need to investigate their presence in a wide range of raw materials, semi finished and finished products as well as in animal feed.

The European Commission first introduced thresholds for the accidental unavoidable presence of GM ingredients; and according to EU Reg. CE/1829/2003 all products (food, feed, GMO derivatives, cultures, aromas and additives) are labeled as to their GMO content.

Real-Time PCR in time established as the gold-standard method for GMOs detection and specific ISO norms (namely ISO21568-21569-21570-21571) regulate it's usage. The base for GMO Corn methods is the detection of DNA sequences of genetic control elements such as promoters, transcription terminators, and markers, such as resistance genes.

Assays performances

The MODIfinder GMO CORN Detection Assay will detect the GMO only if all of the recommended components are stored properly and the recommended protocols are followed.

When used along with Generon ION Force DNA Extractor FAST (Cat. N. EXD001) the assay shows a Limit of Detection of 0.01%.

Detection limit is strictly dependent from the matrix and the genome size of the taxa under investigation, i.e. there is a theoretical LOD you cannot go below.

Assays available

Part number	
PGC01A	MODIfinder Corn Bt176 Assay
PGC02A	MODIfinder Corn MON 810 Assay
PGC03A	MODIfinder Corn T25 Assay
PGC04A	MODIfinder Corn BT11 Assay
PGC05A	MODIfinder Corn NK603 Assay
PGC06A	MODIfinder Corn CBH-351 Assay
PGC07A	MODIfinder Corn GA21 Assay
PGC08A	MODIfinder Corn TC1507 HERCULEX Assay
PGC09A	MODIfinder Corn MON 863 Assay
PGC10A	MODIfinder Corn MIR 604 Assay
PGC11A	MODIfinder Corn DAS 59122 Assay
PGC12A	MODIfinder Corn DBT 418 Assay
PGC13A	MODIfinder Corn 98140 Assay
PGC14A	MODIfinder Corn MIR 162 Assay
PGC15A	MODIfinder Corn BT10 Assay
PGC16A	MODIfinder Corn LY038 Assay
PGC17A	MODIfinder Corn Event 3272 Assay
PGC19A	MODIfinder Corn MON88017 Assay
PGC20A	MODIfinder Corn MON89034 Assay
PGC22A	MODIfinder Corn DAS 40278 Assay
PGC23A	MODIfinder Corn MON87460 Assay

2 - MODIfinder GMO CORN Detection Assay

When used along with GENERase Mastermix (Cat. N. ENG001) this Real-Time PCR assay detects a specific DNA sequence in the DNA of target in less than 1.5 hours. The amplification of the target sequence is measured by the use of a specific fluorescence-labeled probe (FAM).

2.1 - Assay Content

	Box 50 reactions		Box 100 reactions	
	N. vials	Volume (µl)	N. vials	Volume (µl)
MODIfinder OLIGO Mix * (OLIGOS and Probe pre-blended mix)	1	150	2	150
Positive Control	1	120	2	120
Negative Control	1	1000	1	1000

** reagents are supplied with a 5% of extra volume.*

2.2 - Storage & Expiry information

Expiry date: see date on the packaging, product validity refers to the product kept intact in its original packaging. Protect reagents from light exposure as far as OLIGO Mix reagents are photosensitive. Store frozen.

3 – Materials and equipments needed

3.1 – Extraction[1]

Material/Equipment	Source
Extraction Kit	Generon ION Force DNA extractor FAST (Cat. N. EXD001)
Chemicals: n-esane	Lab Suppliers
Tubes, 50 ml and 15 ml	Generon or other Lab Suppliers
DNAse/RNAse Free Water	Generon or other Lab Suppliers
Vortexer	Generon or other Lab Suppliers
Benchtop Centrifuge for 50 ml Tubes	Generon or other Lab Suppliers
Thermal Water Bath or Block	Generon or other Lab Suppliers
Pipette sets	Generon or other Lab Suppliers
Pipette tips (Barrier)	Generon or other Lab Suppliers
Tube rack for 1.5 ml tubes	Generon or other Lab Suppliers
2.0 and 1.5 ml micro-tubes	Generon or other Lab Suppliers
Micro centrifuge for 1.5-2.0 ml micro-tubes	Generon or other Lab Suppliers
DNA Extraction VACUUM BOX + Vacuum pump or Venturi meter	Generon or other Lab Suppliers

Each step of sample preparation (grinding, transferring, weighing, etc.) must be done according to GLP so that chance of cross-contamination between samples is minimized. It is recommended to use disposable equipment when possible.
If the food samples are not in a powdered or granular form, they should be processed (grinded or blended) before DNA extraction. The majority of DNA extraction methods supports from 20 to 50 mg of starting material. Generon ION Force DNA Extractor FAST (Cat. N. EXD001) allows processing up to 20 grams of starting material in order to maximize sample's lot representation.
Once the sample has been pulverized/homogenized, it can be weighed and the appropriate amount extracted according to DNA extraction method selected. Refer to manufacturer user manual for extraction procedure details.

3.3 – Detection via Real-Time PCR

Material/Equipment	Source
Real-Time PCR System [2]	Generon or other Lab Suppliers
MODIfinder GMO Corn Detection Assay	Generon (Cat. N. PGCxxA)
GENERase Mastermix	Generon (Cat. N. ENG001)
Optical Adhesive Seal and Optical reaction plate or Optical Caps and Strips	Generon or other Lab Suppliers
Micropipette sets	Generon or other Lab Suppliers

(1) Equipment necessary only when ION Force DNA Extractor FAST (Cat. N. EXD001) is used.
(2) The assay can be used with Biorad CFX and MiniOpticon, Stratagene MxSeries, ABI 7300-7500-7900-StepONE-StepONE Plus, Light Cycler 480, Eppendorf realplex, Rotor-Gene Q etc. The assay is not compatible with Roche Light Cycler I and II.

4 – Real-Time PCR detection

4.1 – Reaction setup

I. Allow the reagents to thaw (GENERase Mastermix, MODIfinder OLIGO MIX, Positive Control and Negative Control). Vortex tubes when thawed and spin to collect contents at the bottom of the vial.

II. Mix 150 µl of MODIfinder OLIGO Mix with 750 µl of GENERase Mastermix to prepare MODIfinder Working Mastermix (WMX).

III. Vortex briefly and spin down in order to homogenize the mix.

IV. Transfer 18 µl of WMX into each well.

V. Add 12 µl of Negative Control into wells acting as negative control.

VI. Add 12 µl of each sample into wells testing the unknown samples.

VII. Add 12 µl of Positive Control into wells acting as positive control.

VIII. Close wells and ensure no bubbles are present at the bottom of the wells.

IX. Spin briefly optical PCR tubes or plates.

4.2 – Instrument setup

With GENERase Mastermix set the following parameters on your thermocycler:

I. Total Reaction volume: 30 µl

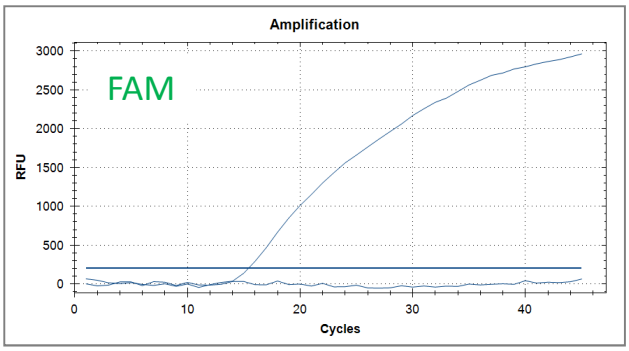
II. Fluorophores/Quenchers: Target GMO CORN (FAM/BHQ1-NFQ);

III. Thermal profile:

Step	T (°C)	Duration	Loops
UNG	50	2 min	1
Taq Activation	95	10 min	1
DNA Denaturation	95	15 sec	45
Annealing/Extension + Plate Reading	60	60 sec	

5 – Data Interpretation

Results evaluation must be done according to the analysis software recommended by the Real-Time PCR instrument manufacturer. After performing PCR, each individual sample is analyzed through the instrument software to produce a Cq value (quantification cycle) for each reporter dye. These values are used to determine the presence (Qualitative Test) of GMO CORN into the sample. See below an example of the graphics obtained for a positive (Fig. A) control for the GMO CORN target amplification (blue line).



After setting the baseline, the analysis outcome should be evaluated following the indications below.

If the following conditions are met:

TEST	GMO CORN (FAM)
Positive Control	+
Negative Control	-

Then the possible results for any sample are:

TEST	GMO CORN (FAM)
Positive Sample	+
Negative Sample	-
Invalid Sample (Inhibited)	-

In case of inhibition DNA isolation and purification for the sample need to be improved or you may need to dilute your sample before performing a new test. Refer to the Troubleshooting paragraph (section 6) for further suggestions.

6 – Troubleshooting

I. Concomitant no target or endo amplification, or amplification plots grossly abnormal. Possible causes and corrective actions:

- An excess of DNA in the target might inhibit the reaction and ENDO may be affected due to an excess of DNA and/or PCR inhibitors. Test samples diluted 1:10 and 1:100. Please, use DNase/RNase Free Water to prepare dilutions.
- Inadequate sealing of optical caps/film caused sample evaporation. Redo the analysis using proper tools and proper optical caps/film to secure perfect sealing.
- Did not use the proper consumables. Redo the analysis and use only optical grade 96-well plates and optical adhesive seal or optical 8-well strips and caps.
- Samples were not properly prepared. Remake the sample DNA preps. Ensure that the DNA extraction method is properly performed.

II. Positive Control reactions failed to amplify, but other reactions appear correct (e.g. the endo is amplified):

- Positive Control DNA was not added to the reaction wells. If other reactions look normal, there may be no need to repeat the run.

III. Negative Control reactions are positive:

- Contamination of the negative control vial or the MODIfinder PCR mix with MODIfinder-positive DNA. Use more care to prevent contamination while handling assay reagents and setting up assays.

In case support is needed contact Generon at: support@generon.it

7 – Disclaimers

The product is intended for research use only. Generon makes no warranty of any kind, either expressed or implied, except that the materials from which its products are made of standard quality. If any materials are defective, Generon will provide a replacement product. Generon shall not be liable for any damages, including special or consequential damage, or expense arising directly or indirectly from the use of this product. Please do not interchange components between assays of different lot numbers. This assay is designed to be used by laboratory personnel following the common molecular biology precautions.

Quick Reference Guide

Product Line:	MODIfinder
Type:	qualitative
Storage:	Frozen
Execution time:	about 120 minutes
Expiry date:	see date on the packaging, product validity refers to the product kept intact in its original packaging and constantly under suitable temperature conditions as mentioned above.

Assay Box Content

	Box 50 reactions		Box 100 reactions	
	N. vials	Volume (µl)	N. vials	Volume (µl)
MODIfinder OLIGO Mix * (OLIGOS and Probe pre-blended mix)	1	150	2	150
Positive Control	1	120	2	120
Negative Control	1	1000	1	1000

* All reagents are supplied with a 5% of extra volume.

Not Provided Article: GENERase Mastermix (Cat. N. ENG001) or equivalent.

Reaction Setup

Protect reagents from light exposure as far as OLIGO Mix reagents are photosensitive.

Before setting the analysis, we strongly advise to leave the reagents to warm up at room temperature. Vortex briefly OLIGO mix, afterwards spin to collect contents at the bottom of the vials. Spin GENERase Mastermix (Cat. N. ENG001) before opening it.

Prepare MODIfinder WORKING Mastermix by adding 150 µl of MODIfinder OLIGO Mix into each tube prefilled with 750 µl of GENERase Mastermix (Cat. N. ENG001) in order to obtain a single volume of 900 µl of MODIfinder WORKING Mastermix. Vortex briefly MODIfinder WORKING Mastermix with the aim of homogenizing the mix and excluding $MgCl_2$ gradient that could impair the results. Spin to collect contents at the bottom of the vial *(Note: label GENERase vials with target name after OLIGO Mix addition)*. Vortex briefly Positive Control and samples before proceeding further, spin to collect contents at the bottom of the vial.

Transfer MODIfinder WORKING Mastermix and samples into the plate as follows:

Reagents per well	Volume
Unknown Sample	12 µl
Positive Control Negative Control	
MODIfinder WORKING Mastermix	18 µl
Final Volume	30 µl

Detector Setup

Target	Reporter Dye	Quencher Dye
GMO CORN	FAM	BHQ1-NFQ

Quick Reference Guide Page 2

Thermal cycling

Step	T (°C)	Duration	Loops
UNG	50	2 min	1
Taq Activation	95	10 min	1
DNA Denaturation	95	15 sec	45
Annealing/Extension + Plate Reading	60	60 sec	

The thermal profile presented above was optimized for GENERase Mastermix (Cat. N. ENG001).

Results analysis

If the following conditions are met:

TEST	GMO CORN (FAM)
Positive Control	+
Negative Control	-

Then the possible results for any sample are:

TEST	GMO CORN (FAM)
Positive Sample	+
Negative Sample	-
Invalid Sample (Inhibited)	-

In case of inhibition DNA isolation and purification for the sample need to be improved or you may need to dilute your sample before performing a new test. Refer to the Troubleshooting paragraph , section 6 in the User Guide, for further suggestions.

Warning and Precaution

Please do not interchange components of assays with different lot numbers. This assay is designed to be used by laboratory personnel following the common molecular biology precautions (GLP).

Disclaimer

Generon s.r.l. guarantees the buyer exclusively concerning the quality of reagents and of the components used to produce the Assay. Generon S.r.l. is not responsible and cannot anyway be considered responsible or jointly responsible for possible damages resulting from the utilization of the product by the user. The user consciously and under his own responsibilities decides for the utilization purposes of the product and uses it the way he considers most suitable in order to reach his goals and/or objectives.

Generon S.r.l. is not responsible for the data resulting from the use of the products, for the utilization that the user independently decides to make of them or for the damages possibly resulting from the disclosure or transmission of the data themselves to third parties under any form or circumstance. This clause is automatically accepted by the user when purchasing the products. The patent for performing PCR is held by Hoffmann/La Roche. Authorization to use PCR can be obtained on licence from Hoffmann-LaRoche. The product, equipment and information included in the assay consists of assembled and reagents. The licence and licence and authorisation for PCR use are not included in the assay. The user is responsible for setting prefixed goals, choosing whether or not to perform the PCR reaction and to apply for register his own licence. The use assay is designed for the services supply, quality control or any other application that is not exclusively an internal company's research and requires a specific licence for PCR use. This PCR use licence to supply a service on food analysis field has to be requested directly from Applied Biosystems". This assay requires the use of Taq Polymerise enzyme.

The product was internally tested by our quality control. Any responsibility is waivered if the warranty of quality control does not refer to the specific product. The user is personally responsible for data that he will obtained and/or he will supply to third parties using this assay. Once the sealed package is open the user accepts all the conditions without fail; if the package is still sealed the product can be returned and the user can be refunded.